

port cards (UP) are located in the back portion of the chassis where external network attachments / cables may be easily connected.

The chassis also supports switch fabric cards 570a and 570b. As shown, each switch fabric card may include multiple switch fabric (SF) cards and a switch scheduler (SS) card. In addition, the chassis supports multiple central processor cards (542 and 543, Fig. 35). Instead of having a single central processor card, the external control functions and the internal control functions may be separated onto different cards as described in U.S. Patent Application Serial Number 09/574,343, filed May 20, 2000 and entitled "Functional

Separation of Internal and External Controls in Network Devices", which is hereby incorporated herein by reference. As shown, the chassis may support internal control (IC) processor cards 542a and 543a and external control (EC) processor cards 542b and 543b. Auxiliary processor (AP) cards 542c and 543c are provided for future expansion to allow more external control cards to be added, for example, to handle new upper layer protocols. In addition, a management interface (MI) card 621 for connecting to an external network management system (62, Fig. 35) is also provided.

The chassis also support two mid-plane printed circuit boards 622a and 622b (Fig. 41c) located toward the middle of chassis 620. Mid-plane 622a is located in the top portion of chassis 620 and is connected to quadrant 1 and 2 forwarding cards 546a-546e and 548a-548e, universal port cards 554a-554h and 556a-556h, and cross-connection cards 562a-562b and 564a-564b. Similarly, mid-plane 622b is located in the bottom portion of chassis 620 and is connected to quadrant 3 and 4 forwarding cards 550a-550e and 552a-552e, universal port cards 558a-558h and 560a-560h, and cross-connection cards 566a-566b and 568a-568b. Through each mid-plane, the cross-connection card in each quadrant may transfer network packets between any of the universal port cards in its quadrant and any of the forwarding cards in its quadrant. In addition, through mid-plane 622a the cross-connection cards in quadrants 1 and 2 may be connected to allow for transfer of network packets between any forwarding cards and port cards in quadrants 1 and 2, and through mid-plane 622b the cross-connection cards in quadrants 3 and 4 may

are replicated to backup configuration database 42'. If the primary centralized processor card experiences a failure or error, the backup centralized processor card may be switched over to become the primary processor and configuration database 42' may be used to keep the network device operational. In addition, any changes to configuration database 42 may be written immediately to flash persistent memory 853 which may also be located on the primary centralized processor card or on another card, and similarly, any changes to backup configuration database 42' may be written immediately to flash persistent memory 853' which may also be located on the backup centralized processor card or another card. These flash-based configuration files protect against loss of data during power failures. In the unlikely event that all copies of the database within the network device are unusable, the data stored in the NMS database may be downloaded to the network device.

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Instead of having a single central processor card (e.g., 12, Fig. 1; 543, Fig. 35), the external control functions and the internal control functions may be separated onto different cards as described in U.S. Patent Application Serial Number 09/574,343, filed May 20, 2000 and entitled "Functional Separation of Internal and External Controls in Network Devices", which is hereby incorporated herein by reference. As shown in Fig. 41a, the chassis may support internal control (IC) processor cards 542a and 543a and external control (EC) processor cards 542b and 543b. In this embodiment, configuration database 42 may be maintained by a processor on internal control processor card 542a and configuration database 42' may be maintained by a processor on internal control processor card 543a, and persistent memory 853 may be located on external control processor card 542b and persistent memory 853' may be located on external control processor card 543b. This increases inter-card communication but also provides increased fault tolerance.

The file transfer protocol (FTP) may provide an efficient, reliable transport out of the network device for data intensive operations. Bulk data applications include accounting, historical statistics and logging. An FTP push (to reduce polling) may be used to send accounting, historical statistics and logging data to a data collector server 857, which may